No. _____
State ____

Section V. RFF RECREATIONAL WATER AVAILABILITY SURVEY

MARINE RECREATIONAL FISHING

We are interested in the extent to which marine recreational fishing opportunities have been limited by pollution. Within your state, we estimate the total surface water area for bays, inlets, and estuaries to be _____ square miles and the total coastal surface water area (to 3 miles offshore, not including bays, inlets, and estuaries) to be _____ square miles.

A. Please make a rough estimate of the percentage of each of these areas for which recreational fishing opportunities were limited in the mid-1970s (roughly 1974-76). By limited opportunitites we mean areas where:

a) fishing was prohibited;
b) fishing was possible, but there were few or no fish to catch;
c) fishing was possible, but only low quality fish were caught;
d) fishing was possible, but there were restrictions on the consumption of the fish.

Please try to divide your estimates between those areas with limited recreational fishing opportunities due to pollution, and those areas with limited recreational fishing opportunities due to reasons other than pollution.

Marine Water Area	Estimated Percent of Marine Water Area in Your State With Limited Fishing in 1974-76 Due to: Pollution	Reasons Other than Pollution	Estimated Percent of Area With No Limitations on Fishing	Total
1. Bays, Inlets. and Estuaries	____% +	____% +	____%	= 100%
2. Coastal (to 3 miles offshore)	____% +	____% +	____%	= 100%

B. If possible, please describe the reasons for limitations other than pollution.

Marine Water Area	Reasons for Limitations Other than Pollution
3. Bays, Inlets, and Estuaries	
4. Coastal (to 3 miles offshore)	

MARINE RECREATIONAL SWIMMING

We are interested in the extent to which marine recreational swimming opportunties have been limited due to pollution. Within your state, we estimate the total amount of beach along your coastline (including bays and inlets) to be _____ miles.

A. If you can, please make an estimate of the percentage of your state's total beach miles that is public beach and the percentage that is private.

5. _____ percent is public beach.

6. _____ percent is private beach.

If you cannot provide this information, just go on to the next question.

B. In the table below, please make a rough estimate of the percentage of each of these total beach miles for which recreational swimming opportunities were limited in the mid-1970s (roughly 1974-76). Please try to divide your estimates between beaches with limited swimming opportunities due to pollution, and beaches with limited swimming opportunities due to reasons other than pollution. Examples of pollution-related reasons for limited beach use are high fecal coliform bacteria counts, turbidity, suspended solids, oil and grease, abnormally high water temperatures, debris, trash, and dead fish. Limitations might or might not have involved official beach closings. If you could not differentiate between public and private beaches in questions #5 and #6 above, please just give a percentage for the undifferentiated category (question #9).

Category of Beach	Estimated Percent of Beach Miles in Your State With Limited Swimming in 1974-76 Due to:		Estimated Percent of Beach Miles With No Limitations on Swimming	Total
	Pollution	Reasons Other than Pollution		
7. Public Beaches	_____%	+ _____%	+ _____%	= 100%
8. Private Beaches	_____%	+ _____%	+ _____%	= 100%
(Unable to Differentiate) 9. Public and Private Beaches	_____%	+ _____%	+ _____%	= 100%

C. If possible, please describe the reasons for limitations other than pollution.

Category of Beach	Reasons for Limitations Other than Pollution
10. Public Beaches	
11. Private Beaches	
(Unable to Differentiate) 12. Public and Private Beaches	

FRESHWATER RECREATIONAL SWIMMING

We are Interested in the extent to which freshwater recreational swimming opportunities have been limited due to pollution. Within your state, we estimate the total freshwater shoreline (lakes and rivers) to be roughly _____ miles. Unfortunately, we do not have sufficient data to differentiate between public and private freshwater shoreline.

A. If you can, please make an estimate of the of the percentage of your state's freshwater shoreline that is public and the percentage that is private.

13. _____ percent is public shoreline.

14. _____ percent is private shoreline.

If you cannot provide this information, just go on to the next question.

B. In the table below please make a rough estimate of the percentage of total freshwater shoreline for which recreational swimming opportunities were limited in the mid-1970s (roughly 1974-76). Please try to divide your estimates between shoreline with limited recreational swimming opportunities due to pollution, and shoreline with limited recreational swimming opportunities due to reasons other than pollution. Examples of pollution-related reasons for limited shoreline use are high fecal coliform bacteria counts, turbidity, suspended solids, oil and grease, abnormally high water temperatures, debris, trash, and dead fish. Limitations might or might not have involved official shoreline closings. If you could not differentiate between public and private shoreline in questions #13 and #14 above, please just give a percentage, for the undifferentiated category (question #17).

Category of Shoreline	Estimated Percent of Shoreline in Your State With Limited Swimming in 1974-76 Due to: Pollution	Reasons Other than Pollution	Estimated Percent of Shoreline With No Limitations on Swimming	Total
15. Public Shoreline	_____% +	_____% +	_____%	= 100%
16. Private Shoreline	_____% +	_____% +	_____%	= 100%
(Unable to Differentiate) 17. Public and Private Shoreline	_____% +	_____% +	_____%	= 100%

C. If possible, please describe the reasons for limitations other than pollution.

Category of Shoreline	Reasons for Limitations Other than Pollution
18. Public Shoreline	
19. Private Shoreline	
(Unable to Differentiate) 20. Public and Private Shoreline	

MARINE RECREATIONAL BOATING

We are interested in the extent to which marine recreational boating opportunities have been limited due to pollution. As already reported in question I. we estimate the total surface water area within your state for bays, inlets, and estuaries to be _____ square miles, and the total coastal surface water area (to 3 miles offshore, not including bays, inlets. and estuaries) to be _____ square miles.

A. In the table below, please make a rough estimate of the percentage of each of these areas for which recreational boating opportunities were limited in the mid-1970s (roughly 1974-76). Please try to divide your estimates between those areas with limited recreational boating opportunities due to pollution, and those areas with limited recreational boating opportunities due to reasons other than pollution. Note: We have differentiated between limitations applying to small boats (refering to those types of boats in which water contact is a real possibility, for example, canoes or small sailboats) and those applying to large boats (refering to those types of boats in which water contact is limited, for example, large power or sail boats). Examples of pollution-related reasons for limited boat use are high fecal coliform bacteria counts, turbidity, suspended solids, oil and grease, debris, trash, and dead fish.

SMALL BOATS (Water Contact is a Possibility)

Marine Water Area	Estimated Percent of Marine Water Area in Your State With Limited Boating in 1974-76 Due to:		Estimated Percent of Area With No Limitations on Boating	Total
	Pollution	Reasons Other than Pollution		
21. Bays, Inlets, and Estuaries	____% +	____% +	____%	= 100%
22. Coastal (to 3 miles offshore)	____% +	____% +	____%	= 100%

LARGE BOATS (Water Contact is Limited)

Marine Water Area	Estimated Percent of Marine Water Area in Your State With Limited Boating in 1974-76 Due to: Pollution	Reasons Other than Pollution	Estimated Percent of Area With No Limitations on Boating	Total
23. Bays, Inlets, and Estuaries	____% +	____% +	____%	= 100%
24. Coastal (to 3 miles offshore)	____% +	____% +	____%	= 100%

3. If possible, please describe the reasons for limitations other than pollution.

SMALL BOATS (Water Contact is a Possibility)

Marine Water Area	Seasons for Limitations Other than Pollution
25. Bays, Inlets. and Estuaries	
26. Coastal (to 3 miles offshore)	

LARGE BOATS (Water Contact is Limited)

Marine Water Area	Seasons for Limitations Other than Pollution
27. Bays, Inlets, and Estuaries.	
28. Coastal (to 3 miles offshore)	

FRESHWATER RECREATIONAL BOATING

We are interested in the extent to which freshwater recreational boating opportunities have been limited due to pollution. Within your state, we estimate the total freshwater surface area (lakes, ponds, rivers, and streams) to be _____ square miles.

A. In the table below, please make a rough estimate of the percentage of this total, freshwater surface area for which recreational boating opportunities were limited in the mid-1970s (roughly 1974-76). Please try to divide your estimates between those areas with limited recreational boating opportunities due to pollution, and those areas with limited recreational boating opportunities due to reasons other than pollution. Note: We have differentiated between limitations applying to small boats (refering to those types of boats in which water contact is a possibility, for example, canoes or small sailboats) and those applying to large boats (refering to those types of boats in which water contact is limited, for example, large power or sail boats). Examples of pollution-related reasons for limited boat use are high fecal coliform bacteria counts, turbidity, suspended solids, oil and grease, debris, trash, and dead fish.

SMALL BOATS (Water Contact is a Possibility)

	Estimated Percent of Fresh-Water Area in Your State With Limited Boating in 1974-76 Due to:		Estimated Percent of Area With No Limitations on Boating	Total
	Pollution	Reasons Other Than Pollution		
29. Total Freshwater Surface Area	_____%	+ _____%	+ _____%	= 100%

LARGE BOATS (Water Contact is Limited)

	Estimated Percent of Fresh-Water Area in Your State With Limited Boating in 1974-76 Due to:		Estimated Percent of Area With No Limitations on Boating	Total
	Pollution	Reasons Other Than Pollution		
30. Total Freshwater Surface Area	_____%	+ _____%	+ _____%	= 100%

B. If possible, please describe the reasons for limitations other than pollution.

SMALL BOATS (Water Contact is a Possibility)

	Reasons for Limitations Other than Pollution
31. Total Freshwater Surface Area	

LARGE BOATS (Water Contact is Limited)

	Reasons for Limitations Other than Pollution
32. Total Freshwater Surface Area	

EFFECTS OF IMPLEMENTATION OF THE CLEAN WATER ACT

We are interested in your opinions on how implementation of various requirements of the Clean Water Act nay effect marine and freshwater-related recreational opportunities. Please read questions A, B, and C and then fill out the table on the following page. If there are any areas that are not within your field of expertise, please cross them out in the table.

A. in your opinion, how has implementation of Best Practicable Technology (BPT) applied to convention pollutant discharges (e.g., BOD, oil and grease, suspended solids, and dissolved solids) affected the availability for fishing, swimming. and boating of your state's marine and freshwater areas? [Note: The President's Council on Environmental Quality estimates that by 1982, 96 percent of industries had met their BPT requirements.]

3. In your opinion, how will implementation of Best Available Technology (BAT) for toxic pollutants (e.g., pesticides, heavy metals PCBs, etc.) and non-conventional pollutants (e.g., COD, ammonia, sulfides, nitrogen, and phosphorus) and Best Conventional Technology (BCT) for conventional pollutants (e.g., BOD. oil and grease, pH. suspended solids, and fecal coliform) affect the availability for fishing, swimming, and boating of your state's marine and freshwater areas? [Note: These requirements--BAT and BCT--are designed to be more stringent than BPT.]

C. For non-point sources of pollution (e.g., agricultural and urban runoff, etc.) other, more vague goals have been built into the Clean Water Act. If your state has plans to implement Best Management Practices (BMP), in addition to BAT/BCT, to control non-point sources of pollution, please indicate how you believe this will affect the availability for fishing, swimming, and boating of your state's marine and freshwater areas.

NOTE: These questions relate only to pollution control. We assume that water areas or shoreline/beach miles unavailable for recreation due to reasons other than pollution (such as natural temperature or topography) will remain unavailable in the future matter what pollution control measures are taken.

The example below illustrates our intentions for these questions: If, in the mid-1970s, 40% of your total marine coastal water area was subject to pollution-related limitations on fishing, you would have answered 40% in column (1) of question (2) on page 1. If, after full implementation of BPT, half of that water area was "cleaned up," the BPT blank in question (34) below should read 20%. If you estimate that after full implementation of BAT/BCT, half of the water area still subject to fishing limitations due to pollution, i.e., 20%, will be "cleaned up," the BAT/BCT blank in question (34) should read 10%--the amount of coastal water still subject to pollution-caused fishing limitations. If you estimate that after full implementation of BAT/BCT & BMP there will be no further changes, the BAT/BCT & BMP blank in question (34) should also read 10%.

Example:

	BPT	BAT/BCT	BAT/BCT & BMP
34. Coastal (to 3 miles offshore)	20 %	10 %	10 %

****

PERCENT OF TOTAL MARINE WATER AREAS FOR WHICH FISHING LIMITATIONS DUE TO POLLUTION WILL STILL EXIST AFTER THE IMPLEMENTATION OF:

Marine Recreational Fishing	BPT	BAT/BCT	BAT/BCT & BMP
33. Bays, Inlets, and Estuaries	____%	____%	____%
34. Coastal (to 3 miles offshore)	____%	____%	____%

PERCENT OF TOTAL MARINE BEACH MILES FOR WHICH SWIMMING LIMITATIONS DUE TO POLLUTION WILL STILL EXIST AFTER THE IMPLEMENTATION OF:

Marine Recreational Swimming	BPT	BAT/BCT	BAT/BCT & BMP
35. Public Beaches	____%	____%	____%
36. Private Beaches	____%	____%	____%
(Unable to Differentiate) 37. Public and Private Beaches	____%	____%	____%

PERCENT OF TOTAL MARINE WATER AREAS FOR WHICH BOATING LIMITATIONS DUE TO POLLUTION WILL STILL EXIST AFTER THE IMPLEMENTATION OF:

	BPT	BAT/BCT	BAT/BCT & BMP
Marine Recreational Boating			
38. Bays, Inlets and Estuaries	____%	____%	____%
39. Coastal (to 3 miles offshore)	____%	____%	____%

PERCENT OF TOTAL FRESHWATER SHORELINE FOR WHICH SWIMMING LIMITATIONS DUE TO POLLUTION WILL STILL EXIST AFTER THE IMPLEMENTATION OF:

	BPT	BAT/BCT	BAT/BCT & BMP
Freshwater Recreational Swimming			
40. Public Shoreline	____%	____%	____%
41. Private Shoreline	____%	____%	____%
(Unable to Differentiate) 42. Public and Private Shoreline	____%	____%	____%

PERCENT OF TOTAL FRESHWATER AREA FOR WHICH BOATING LIMITATIONS DUE TO POLLUTION WILL STILL EXIST AFTER THE IMPLEMENTATION OF:

	BPT	BAT/BCT	BAT/BCT & BMP
Freshwater Recreational Boating			
43. Total Freshwater Surface Area	____%	____%	____%

Section VI. REASONS OR LIMITATIONS OTHER THAN POLLUTION

A Not applicable

B Restricted area, for example, military zone, public water supply, boating safety zone, sea lanes for large ships

C Limited access

D Natural limitations, for example, turbidity due to natural sedimentation, water too cold, swift currents, rocky bottom, intermittent flows, high seas

E Man-made physical obstructions, for example, log rafts, waterways "plugged"-- earthen dams or log structures constructed--by pipeline companies, levees, dams

F Water depth, for example, usually too shallow

G Overfishing by man

H Man-made destruction of natural habitat, for example, oil field development, dredging

I Salinity changes due to terrestrial runoff fluctuations

J Menacing marine creatures, for example, sharks, red tide, man-o-war, sea nettles

K Eutrophication (natural)

L Storm water overflow causing temporary effluent by-pass

M Conservation needs, for example, necessary to limit fishing in order to maintain fish population levels

N Restrictions on certain kinds of water craft, for example, boats with heads prohibited, boats with engines prohibited

O Lack of facilities, for example, insufficient boat ramps, marinas, and piers

P Alewife die-offs washed up on beach

Q Lack of beach, development on freshwater lakes

R High water levels which wash out beaches

S Areas filled to capacity (swimming)

T Lack of facilities, for example, parking, sanitary changing facilities.

Section VII. WATER AREA CALCULATIONS: FRESHWATER AND MARINE BAYS, INLETS, AND ESTUARIES

Our primary source of water area measurements for the United States was the Area Measurement Report prepared by the U.S. Census Bureau in 1940, 1960 and 1980 (still in progress). These measurements were made from maps, not from actual physical inspection of the Land, and only large water bodies (large enough to be represented on maps with scales large enough to cover the United States without the number of maps becoming prohibitively large) were included. This restriction produced what is sometimes called "census water." It includes ponds and lakes over 40 acres and streams and canals at least 1/8 of a mile wide[1].

In order to obtain all inland water areas by state, we supplemented the "census water" with a study done by Iowa State University in 1975.[2] This study contained estimates of water area for lakes smaller than 40 acres and streams less than 1/8 of a mile wide; that is, all freshwater bodies not included in the Census Bureau water.

Another problem crops up with the measurements of coastal water areas. In general, the Census Bureau used the true shoreline of marine and Great Lakes coasts to delineate inland and coastal waters. However, rules were developed to consistently distinguish between inland and coastal waters when irregularities, such as embayments or islands, were encountered. Embayments with headlands less than one nautical mile apart were connected

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1. U.S. Bureau of the Census, Area Measurement Reports (Washington, D.C., U.S. Government Printing Offices, 1967).

2. Hickman, R. CNI-Noninventory Magentic Tape (Ames, IA, Statistical Laboratory, Iowa State University, July, 1975).

and the water area within these bays was included in inland water. The water area between shore and islands less than one nautical mile from shore, or strings of islands each less than one nautical mile apart which began and ended within one nautical mile of the mainland was also considered inland water.[3]

Unfortunately, large distortions In freshwater availability result if census "inland" water is equated with "freshwater." These distortions were prevalent along the eastern seaboard where the frequent occurrence of barrier islands resulted in large areas of marine water being counted as "inland" water. In North Carolina, for example, the barrier islands aver 10 miles from the mainland were considered the boundary between inland and coastal water because the islands begin close to shore and have no breaks in the chain greater than one nautical mile. As a consequence, about 3,000 square miles of marine water were included as inland water within the state boundary.

We felt it was necessary to remove these distortions by correcting inland water as defined in the Census Bureau's approach. Using a complete set of U.S. Geological Survey maps (scale 1:250,000), we measured the distance between headlands of every embayment, and the shore-to-island distance along the entire coastline of each state. Whenever the conditions defining inland but marine waters encountered, the area of the embayment was carefully traced and measured using a planimeter.[4]

By subtracting inland but marine water areas from the sum of the two original water areas ("census water" plus small water bodies), we arrived

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3. Personal communication with Dr. Robert Durland, Geography Division, U.S. Bureau of the Census, Washington; D.C.

4. A planimeter, is an engineering instrument that measures the area of irregular shapes when the planimeter arm is moved around the perimeter of the shape.

at an estimate of the area of freshwater for each of the forty-eight contiguous states and their 3,070 counties. These same inland but marine water area measurements were then added to the Census Bureau's measurements of bays and estuaries not subsumed in the inland water measure (for example, bays with wide mouths such as Delaware, Chesapeake, and Mobile). We thus arrived at state and county totals for bays and estuaries. We measured coastal marine water, as stated in the text, as a strip 3 miles off the ocean-facing shore of the state. This measurement is not broken down by county.

Table III-1 shows state totals of freshwater area, large and small bay and estuary area, and marine coastal area (to 3 miles) f'or the 48 contiguous states.

Table III-1 State Water Area Totals

	Freshwater (sq. mi.)	Bays and Estuaries (sq. mi.)	Coastal Area (to 3 miles offshore, sq. mi.)
ALABAMA	43	589	159
ARIZONA	528	0	0
ARKANSAS	1416	0	0
CALIFORNIA	1678	511	2520
COLORADO	568	0	0
CONNECTICUT	169	598	0
DELAWARE	92	383	84
FLORIDA	3637	3166	4050
GEORGIA	1058	149	300
IDAHO	1312	0	0
ILLINOIS	816	0	0
INDIANA	359	0	0
IOWA	381	0	0
KANSAS	1211	0	0
KENTUCKY	897	0	0
LOUISIANA	3158	2254	1191
MAINE	1746	1675	684
MARYLAND	344	2115	93
MASSACHUSETTS	303	1081	576
MICHIGAN	1566	0	0
MINNESOTA	5328	0	0
MISSISSIPPI	945	566	300[a]
MISSOURI	1071	0	0
MONTANA	1912	0	0
NEBRASKA	901	0	0
NEVADA	454	0	0
NEW HAMPSHIRE	317	13	39
NEW JERSEY	198	542	390
NEW MEXICO	470	0	0
NEW YORK	1619	1093	381
NORTH CAROLINA	1111	2935	903
NORTH DAKOTA	1753	0	0
OHIO	366	0	0
OKLAHOMA	1713	0	0
OREGON	1026	100	888
PENNSYLVANIA	627	0	0
RHODE ISLAND	54	139	120
SO. CAROLINA	983	217	561
SO. DAKOTA	1638	0	0
TENNESSEE	1213	0	0
TEXAS	3481	3412	1101
UTAH	1005	0	0
VERMONT	385	0	0
VIRGINIA	965	1687	336
WASHINGTON	1443	2795	471
WEST VIRGINIA	186	0	0
WISCONSIN	2078	0	0
WYOMING	1107	0	0

[a]The coastline for Mississippiwas increased because we used the length of the mainland beach instead of the length of the string of islands, as the National Oceanic and Atmospheric Administration did in Coastline of the United States, April 1961.

Section VIII. FRESHWATER SHORELINE

The linear miles of freshwater shoreline were estimated for each of the 48 contiguous states as a proxy for the potential availability of freshwater for swimming. Miles of shoreline will characterize availability more accurately than areal measures, since true accessibility and thus availability for swimming would differ for two states with the same water area if one of the states had hundreds of small lakes while the other state had all of its water in a few large lakes.

A rough approximation of shore length was derived from three water area statistics for each state: linear miles of river, square miles of lakes, and the number of lakes. These figures are given for both coldwater and warmwater in A Summary of Selected Fish and Wildlife Characteristics of the 50 States.[1] There were some gaps in coverage for these statistics; only complete coverage would allow estimated shoreline miles to be calculated for every state. Table 4-1 presents the above data, with explanations of how the gaps were filled. Table 4-2 shows the figures calculated from the information in Table 4-1. Warmwater and coldwater calculations were similar, but done separately, so that warm and coldwater could be used separately as explanatory variables in later stages of the research.

Miles of river shoreline were calculated by simply doubling total river miles for each state to account for the shore on both sides of the rivers. This figure does not account for physical and legal obstacles to river access and is generally several times larger than official state

1. U.S. Department of the Interior, Fish and Wildlife Service, A Summary of Selected Fish and Wildlife Characteristics of the 50 States (Washington, D.C., Government Printing Office, March 1983).

estimates of, say, swimming beaches. But such official estimates are neither available for all states nor based on consistent definitions where available, so that our measure was necessary.

Total miles of lake shoreline were estimated by first calculating the shoreline of the average-sized lake in each state and water category. This calculation was done under the extreme simplifying assumption that this average lake was a circle with smooth shoreline. The calculations were as follows:

$$\text{Average Lake Size} = A_i = \frac{\text{Total Square Miles of Lakes}}{\text{Total Number of Lakes}} \text{ in state } i$$

For a circular lake:

$A_i = \pi R_i^2$ (where R_i is the average lake radius in state i)

or $R_i = (A_i/\pi)^{1/2}$

Then, average lake circumference or shoreline or $C_i = 2\pi R_i = 2\pi(A_i/\pi)^{1/2} = 2(\pi A_i)^{1/2}$

Finally, average lake circumference multiplied by the number of lakes yielded our estimate of total lake shoreline miles.

Table IV-1. Data for Freshwater Shoreline

state	Warmwater			Coldwater		
	Rivers (Miles)	Lakes (Acres)	Lakes (Number)	Rivers (Miles)	Lakes (Acres)	Lakes (Numbers)
ALABAMA	7880[s]	630000	120238[h]	5	0	0
ARIZONA	1040[s]	33973	80	1550	3084[k]	56[k]
ARKANSAS	9500	621000	93731	165	91183	11
CALIFORNIA	3331	180276	438	17958	278316	3545
COLORADO	3000	65000	105	9000	120000	2500
CONNECTICUT[t]	5796[a]	41400	4140[h]	2604	18600	1860[r]
DELAWARE	844	2985	57	134	0	0
FLORIDA	11910	3014890	7712	0	0	0
GEORGIA	12338	531590	65000	3987	30167	230
IDAHO	707[a]	49427	164[h]	16000	415930	2217[p]
ILLINOIS	13204	301518	83763	0[l]	0	0[p]
INDIANA	6600	106741	571	0[l]	3375[k]	2
IOWA	19000	131200	80240	280	0[k]	0[k]
KANSAS	8700	252930	56124	0	0	0
KENTUCKY	14000	261000	50100	0	0	0
LOUISIANA	62770	2384685	663	0	0	0
MAINE	6400	507887	759	25600	727592	1158
MARYLAND	2285[a]	25000	114	420	9459[k]	64[k]
MASSACHUSETTS[t]	1800	72850	1786	2120	82150	2014
MICHIGAN	38571	597562	7002	12610	162658	740
MINNESOTA	14400	2836353[c]	1557[c]	1850	103106[m]	618[q]
MISSISSIPPI	14105	356925	128180	0	0	0
MISSOURI	30582	565000	320000	117	1700	1
MONTANA	2000	245000[d]	100[d]	12000	745000[d]	300[d]
NEBRASKA	11744	192115	18061	624	0	0
NEVADA[t]	2960	159287	142	4439	238931	213
NEW HAMPSHIRE	846[a]	85106[e]	512[e]	4174[j]	53358[e]	193[e]
NEW JERSEY	6156	46660	4151	2517	14754	23
NEW MEXICO	1343	80630	64	1935	34494	62
NEW YORK	55000	471032[f]	1075[f]	15000	278968[f]	461[f]
NO. CAROLINA	36000	866504	68715	4000	18756[k]	163[k]
NO. DAKOTA	5305[a]	625000	180	10	429692[n]	1
OHIO	47000	168370	31277	40	0	0
OKLAHOMA	23000	1030000	200146	8[l]	14200	1
OREGON	2500	159000	670	27000	302900	1421
PENNSYLVANIA	20000	157000	2080	25000	20000	100
RHODE ISLAND	515	14024	353	499	4408	4
SO. CAROLINA	3800	555000	48508	200	37467[k]	286[k]
SO. DAKOTA	3300	778100	92446	270	3110	65
TENNESSEE	17313	569951	85174	1916	0	0
TEXAS	80000	1820000	266400	0	0	0
UTAH	1177	291470	370[h]	6880	92676	492[p]
VERMONT	1200	56000	300[h]	3600	168733	1086[p]
VIRGINIA	16720[a]	217500	46500	3100	825	40
WASHINGTON	9500	166715[g]	1520	40500	710731[g]	6480
WEST VIRGINIA	3970	23450	17910	1750	0[k]	0[k]
WISCONSIN	15000	970869	14958	6591	32000	586
WYOMING	0[b]	0[b]	0[b]	15661	306432	4360

Notes to Table IV-1

a. For six states we had data on area of warmwater rivers but not on length. To estimate length we used the average acreage per mile of warmwater rivers implied by the 19 states with both pieces of data. This figure was 12.69 ac/mi. The area data and implied mileage for the six states are reported below:

Alabama	100,300 acres	7,880 miles
Idaho	8,373 acres	707 miles
Maryland	29,300 acres	2,295 miles
New Hampshire	10,741 acres	846 miles
North Dakota	67,370 acres	5,305 miles
Virginia	212,228 acres	16,720 miles

The warmwater river acreage, for New Hampshire was derived from a figure of combined warm and cold rivers of 32,225 acres. Since one third of the state's lake acreage is reported as warm, it was assumed that one third of the total river acreage was also warmwater.

Neither area nor length data are provided by the Department of the Interior[2] for North Dakota, though they note that the only coldwater river mileage is a 10 mile stretch of the Missouri River. As reported by the Department of Interior,[3] six percent of the total water area of South Dakota is streams. Assuming that North Dakota has the same proportion of streams and rivers to total water, and applying it to the North Dakota freshwater area figure of 1,122,012 acres produces 67,320 acres as the area of warmwater rivers in North Dakota. The freshwater area for North Dakota is the area we

2. Ibid.

3. U.S. Department of the Interior, Fish and Wildlife Service, National Survey of Needs for Hatchery Fish, Bureau of Sport Fisheries and Wildlife, Publication No. 63 (Washington, D.C., Government Printing Office, 1968).

found by correcting "census water" for the exclusion of small lakes and rivers (see appendix III).

In Virginia, the total stream area is 228,180 acres.[4] The coldwater table in the U.S. Department of Interior[5] reports 3,100 miles of coldwater streams. We can convert this figure to acres with the average acreage per mile of coldwater streams calculated from the states which report both coldwater river acreage and length. These 12 states report 527,206 acres covered by 102,444 miles of river for an average of 5.146 acres per mile. Then 3,100 miles of coldwater streams represent 15,353 acres of cold streams. Subtracting the coldwater stream acreage from total stream acreage gives the warmwater stream area of 212,228 acres.

b. In Wyoming, there exists almost no warmwater habitat, according to the Department of the Interior,[6] leading to the zero figures for warmwater streams and lakes.

c. Minnesota's reported total lake acreage of 2,649,070 acres was only for fishable water. Since the total water area for the state (excluding Lake Superior) is 3,131,754 acres, the difference of 482,684 acres represents unfishable lakes plus river acreage. We can obtain an estimate of total river acreage by converting the warm and cold river miles to acres using the average acres per mile estimates (see note a). Subtracting the resulting total river acreage of 192,295, leaves 290,389 acres as an estimate of total unfishable lake acreage. Splitting this area on the basis of the ratio of coldwater

4. Ibid.

5. U.S. Department of the Interior, A Summary of Selected Fish.

6. Ibid.

to warmwater from the figures reported for fishable lakes gives 280,203 acres of unfishable warmwater lakes. This is added to the reported fishable warm lakes to give 2,836,353 acres of warmwater lakes. There are 2,715 fishable warm lakes and 223 fishable cold lakes or 92 percent warm lakes. The notes to the Department of Interior's table[7] report 2,938 fishable lakes, 2,865 unclassified lakes and 2,372 marginal lakes for a total of 8,175 and cold lakes. We preserved the proportions of warm and cold lakes from the fishable lake data and thus estimate that there are 7,557 warm lakes.

d. George Holton, Montana Department of Fish and Game, reports (personal communication) 100 warmwater lakes totaling 245,000 acres, and 300 coldwater lakes totalling 745,000 acres in that state.

e. The reported water area for New Hampshire excluded 28 ponds totaling 74,360 acres. These excluded ponds were added to numbers and acreage of warmwater and coldwater lakes, so as to preserve the overall ratio of coldwater to warmwater, reported in National Survey of Needs for Hatchery Fish at 57:43.

f. The reported lake acreage for New York represents double-counting of two-tiered lakes as both warm and coldwater area. The total lake acreage of New York without double-counting is reported as 750,000 acres; 1,952,480 acres is reported with double-counting. The reported. area of warmwater lakes with double counting is 1,226,240 acres, or 62.8 percent of the double-counted total. Applying the same proportion to the single-counted total area of 750,000 acres fields 471,032 acres as the area of warmwater lakes and 278,968 acres as the area of coldwater lakes. The total number of lakes with double

7. Ibid.

counting are given as 1200 coldwater and 2800 warmwater. Correcting each number by ratio of single-counted acres to double-counted acres (0.384) produces estimates of 1075 warmwater and 461 coldwater lakes.

g. No lake acreages were reported for Washington. The reported total area of freshwater is 923,627 acres (from our corrections to "census water, see appendix III) and five percent of this total is rivers.[8] The remaining 877,446 acres of lakes were divided between warm and cold lakes by taking 81% of the total to be coldwater.[9]

h. Four states had no data on the number of warmwater lakes. The average size of warmwater lakes in surrounding states was calculated, and this average was effectively assigned to the states with no number data. The four states and their asssigned average areas are: Alabama (average warm lake size 5.240 acres), Idaho (average warm lake size 165 acres), Utah (average warm lake size 790 acres), and Vermont (average warm lake size 186 acres). The estimated number of warm lakes shown in the table for these states comes from division of total warm lake acreage by these assigned averages.

i. The notes to the reported Indiana data state that there are only two tributary streams to Lake Michigan which support coldwater fish. On this basis, miles of coldwater river in the state were assumed to be zero.

j. New Hampshire reported 32,225 acres of combined warn and cold rivers. Since two thirds of the lake acreage is reported as cold lakes, it was assumed that two thirds of the total river acreage was also cold, or 21,483 acres of cold rivers. This figure, divided by the average

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8. U.S. Department of the Interior, National Survey.

9. Ibid.

acres per mile of coldwater rivers and stream (5.15, see note a) gives 4174 coldwater stream miles.

k. There was no coldwater lake information (acreage or number) available for Arkansas, Iowa, Maryland, North Carolina, South Carolina, and West Virginia. The U.S. Department of Interior[10] reported fishable coldwater acreage projections for the year 2000, where increases over current actual figures were due to clean-up and man-made water bodies. We converted the coldwater river and stream miles for these states to acreage (multiplying by 5.15, see note a) and subtracted this from the total coldwater acreage, giving an estimate of coldwater lake acreage. in the case of Iowa and West Virginia, this produced a negative number, and we assumed that this implied no coldwater lake acreage. For the four states with positive coldwater lake area, we calculated an estimated number of coldwater lakes based on the average coldwater lake area of the surrounding states: Arkansas average coldwater lake. size, 7950 acres, Maryland average coldwater lake size, 149 acres, North Carolina average coldwater lake size, 115 acres, and South Carolina average coldwater lake size, 131 acres.

l. As reported in the notes to the Coldwater Aquatic Habitat table,[11] Oklahoma has an 8 mile stretch of tailwater form Lake Tenkiller, which. we treat here as the coldwater river and stream mileage for the state.

m. For Minnesota, see note c. Preserving the ratio of coldwater to warmwater from the figures reported for fishable lakes leaves 10,186 acres of unfishable coldwater lakes. This is added to the report fishable coldwater lakes to give 103,106 acres of coldwater lakes.

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10. Ibid.

11. U.S. Department of the Interior, A Summary of Selected Fish.

n. The freshwater area of North Dakota is 1,122,012 acres (from our corrections to "census water," see appendix III). Subtracting from this the 67,320 acres of streams and rivers and the reported 625,000 acres of warmwater lakes leaves 429,692 acres of coldwater lakes (see note a for North Dakota).

p. Three states had no data on the number of coldwater lakes. For each, the average size of coldwater lakes in surrounding states was computed and assigned to the state. The three states are Idaho and Utah (average lake size 188 acres) and Vermont (average lake size 155 acres). The cold lake acreage of the three states was divided by the respective area average cold lake size to give an estimate of the number of lakes. The number of cold lakes in Illinois is given as zero, since the only coldwater lake is Lake Michigan.

q. For Minnesota see note c. Our method gives an estimate of 618 coldwater lakes.

r. The figure for number of lakes in Connecticut is taken from the Statewide Comprehensive Outdoor Recreation Plan[12] and is split into warm and cold water according to the percentages given by the U.S. Department of Interior, [13] (31% coldwater for Connecticut).

s. There is an error in the Department of Interior table[14] for coldwater rivers in Connecticut. The figure is presented as total acres but is really total miles.[15]

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12. Connecticut Department of Environmental Protection, Statewide Comprehensive Outdoor Recreation Plan (Hartford, CT, Department of Environmental Protection, 1978).

13. U.S. Department of the Interior, National Survey.

14. U.S. Department of the Interior, A Summary of Selected Fish.

15. Personal communication with Dr. Warren L. Fisher, U.S. Department of Interior, Fish and Wildlife Service, Washington, D.C.

t. Four states had all data presented as combined coldwater and warmwater by the Department of Interior.[16] The National Survey of Needs for Hatchery Fish[17] state summaries give the percentage coldwater of total inland water for these states. We apply these percentages to the combined data.

Connecticut	31% coldwater
Massachusetts	53% coldwater
Nevada	60% coldwater
Washington	81% coldwater

16. U.S. Department of the Interior, A Summary of Selected Fish.

17. U.S. Department of Interior, 1968.

Table IV-2. Estimated Freshwater Shoreline by State

State	Warmwater Lake Shoreline	Warmwater River Shoreline	Warmwater Total	Coldwater Lake Shoreline	Coldwater River Shoreline	Coldwater Total	Total Freshwater Shoreline Miles
ALABAMA	38566	15758	54324	0	10	10	54334
ARIZONA	231	2080	2311	58	3100	3158	5469
ARKANSAS	33801	19000	52807	140	330	470	53277
CALIFORNIA	1245	6674	7919	4401	35916	40317	48237
COLORADO	366	6000	6366	2427	18000	20427	26193
CONNECTICUT	1835	11592	13426	824	5208	6032	19459
DELAWARE	58	1688	1746	0	268	260	2014
FLORIDA	21366	23820	45187	0	0	0	45187
GEORGIA	26047	24676	50723	369	7974	8343	59066
IDAHO	399	1414	1813	4255	32000	36255	38068
ILLINOIS	22269	26200	48677	0	0	0	48677
INDIANA	1094	13200	14294	12	0	12	14305
IOWA	14377	38000	52377	0	560	560	52931
KANSAS	16695	17400	34095	0	0	0	34095
KENTUCKY	16023	28000	44023	0	0	0	44023
LOUISIANA	5572	125540	131112	0	0	0	131112
MAINE	2752	12800	15551	4067	51200	55267	70819
MARYLAND	237	4570	4807	109	840	949	5156
MASSACHUSETTS	1598	3760	5358	1802	4240	6042	11401
MICHIGAN	9064	77142	86206	1537	25220	26757	112963
MINNESOTA	20515	28800	49315	1119	3700	4819	54133
MISSISSIPPI	29972	28210	58182	0	0	0	58182
MISSOURI	59562	61164	120746	6	234	240	120986
MONTANA	694	4000	4694	2095	24000	26045	30788
NEBRASKA	8254	23488	31742	0	1248	1248	32990
NEVADA	666	5920	6586	1000	8878	9878	16464
NEW HAMPSHIRE	925	1692	2617	450	8348	8798	11415
NEW JERSEY	1950	12312	14262	82	5034	5116	19318
NEW MEXICO	318	2686	3004	205	3870	4075	7079
NEW YORK	3153	110000	113153	1589	30000	31589	144742
NO. CAROLINA	34192	72000	106192	245	8000	8245	114437
NO. DAKOTA	1486	10610	12096	92	20	112	12208
OHIO	10169	94000	104169	0	80	80	104249
OKLAHOMA	63622	46000	109622	17	16	33	109655
OREGON	1446	5000	6446	2907	54000	56907	63353
PENNSYLVANIA	2532	40000	42532	196	50000	50198	92730
RHODE ISLAND	312	1030	1342	19	998	1017	2358
SO. CAROLINA	22992	7600	30592	459	400	859	31450
SO. DAKOTA	37582	6600	44182	63	540	603	44785
TENNESSEE	30874	34626	65500	0	3832	3832	69332
TEXAS	91570	160000	257570	0	0	0	251510
UTAH	1455	2354	3809	946	13760	14706	18515
VERMONT	514	2400	2914	1897	7200	9097	12071
VIRGINIA	14092	33440	47532	25	6200	6226	53757
WASHINGTON	2231	19000	21231	9509	81000	90509	111740
WEST VIRGINIA	2872	7940	10812	0	3500	3500	14312
WISCONSIN	16886	10000	46886	607	19122	19729	66615
WYOMING	0	0	0	5122	31322	36444	36444

APPENDIX 5.D

SUPPLY VARIABLES DATA BASE

The “Supply Variables Data Base” is a county-level file of physical attribute measurements, including availability of recreation resources, average and extreme climatic conditions, and the size of the county road network. The availability of recreation resources within a recreationist’s county and the distribution of these resources among his region's counties and states is a proxy for the expected travel distance to a specific type of recreation site. The data on temperature and precipitation may help isolate the effects of climate on the recreation participation decision and on the total number of activity days. For example, it is reasonable to expect that less outdoor recreation may occur over the year in northern states because inhospitable weather conditions restrict outdoor activity over the winter season. In contrast, southern Florida, for example, offers an amenable climate year-round. The data on county surface areas covered by various types of roadways will stand as an inverse proxy for travel time and accessibility. A county in the wilderness may have fine recreation attributes, but if none of the county land area is devoted to roadways the cost of access will be high in terms of time and effort involved.

AVAILABILITY

The availability of outdoor recreation resources is an obvious factor in the recreationists participation decision. The supply of facilities for water-based recreation, such as boat slips may be expected to influence the decision whether or not to own a large boat. Because recreation time is limited, facilities for alternative activities such as gold courses and tennis courts may also be expected to have an effect.

Water Availability

The primary source of water area measurements by county for the United States is the Area Measurement Report prepared by the U.S. Census Bureau. These Area Measurement Reports were made in 1940, 1960 and 1980. Because the county measurements we plan to use are derived from these reports, it will be helpful to review the definitions and methodology used by the Census Bureau.

The Census Bureau makes a distinction between inland and coastal waters. This applies primarily to the marine and Great Lakes coastlines. In general, this delineation follows the shore line, but rules were developed so that whenever irregularities such as embayments or islands were encountered, the distinction between coastal and inland water would be consistent. Where embayments occur which have headlands less than one nautical mile apart, a straight line was drawn connecting the headlands. The area of these bays are included as inland water. When islands are less than one nautical mile from shore, or when strings of islands each less than one nautical mile apart begin and end within one nautical mile of shore, lines are drawn from the shore to the tip of the island or string of islands and the water between the shore and the islands is included in inland water. [1]

At the state or national scale, these fine distinctions are not important, and inland water can effectively be considered mostly freshwater. But at the county level, large distortions in freshwater availability can occur if one assumes a definitional equivalence between inland water and freshwater. These distortions are prevalent along the eastern seaboard where the frequent carrier islands result in large areas of marine water being counted as inland fresh water. In North Carolina,

for example, the barrier islands can be over 10 miles from the mainland but are still considered the boundary between inland and coastal water because the islands begin close to shore and have no breaks in the chain greater than one nautical mile. As a consequence, about 3,000 square miles of marine water are included as freshwater within the state boundary. This large body of inland marine water results in counties in North Carolina, such as Dare County, being erroneously considered 69 percent freshwater, Along the marine coasts of the United States, these inland marine water bodies can distort the calculation of area of freshwater by county. The counties surrounding the Great Lakes are also affected by this inland water definition in the context of our use of water availability measurements in estimation.

When using Census Bureau freshwater availability data, a correction must also be made for smaller areas of water. "Census water" includes only ponds and lakes of 40 acres or more and streams and canals at least 1/8 of a mile in width. (Bureau of the Census, 1967). Area measurements are made from maps and not from actual physical inspection of the land. In order for water to be included in the area calculations, they must be large enough to be represented on maps with scales that are large enough to cover the United States without the number of maps becoming prohibitively large. This condition results in what is sometimes called "census water." Fortunately, a separates measure of lakes less than 40 acres and streams less than 1/8 of a mile wide is available, as discussed below.

Inland saline lakes are also included in measurements of freshwater. This, too, should be taken into account. In the semi-arid parts of the western United States, where these lakes commonly are found, saline water can represent a large percentage of the water in a particular county.

Given the above limitations of the definition of inland water used by the Census Bureau for the calculation of freshwater area (in that it includes some saltwater and does not include all freshwater), an effort was made to locate a source of water area measurements designed specifically to measure freshwater availability. The most recent, complete, and reliable source of surface water availability is the Geoecology Data Base developed by Oak Ridge National Laboratories for the U.S. Department of Energy. Three files within this extensive data base contain useful data that can be combined to create the foundation of county surface water data. The "County Codes, Names, and Centroids" file contains the names, and the Federal Information Processing System (FIPS) codes for all the states and countries in the contiguous 48 states. The "Land Area" file contains the total area of each county, the area of census water in each county, and the area of Land in each county. The "Land Use" file contains estimates of the areas of small lakes and streams made by Iowa State University. This "small lake" area is the area of lakes smaller than 40 acres and streams less than 1/8 of a mile wide; that is, water bodies not included in Census Bureau water.

The Geoecology database contains some of the county area figures already discussed, particularly the total area of each county and the area of land and census water in each county. The CO_AREA variable contains land area (not total surface area, as the Geoecology name might imply) in square miles and is equivalent to the land area listed in table 2 of the 1972 County and City Data Book (and thus includes the area of small water bodies, as above). Geoecology also includes a similar measure for 1977, LAND_77, based on updated information from the 1967 Conservation Needs Inventory (CNI) (USDA). This land area figure has been standardized to the

1970 Census area (for the set of 3070 counties), since the totals of county land use areas in the 1967 CNI often do not equal the census area. In addition, when the measure of census water, CENS_WAT (called WATER_77 in Geoecology), is added to LAND_77, we have a measure of surface area, AREA_77. Iowa State University provided Geoecology with estimates of the area of small lakes, SML_LAKE. This variable measures the area of lakes and ponds of less than 40 acres and streams and rivers less than 1/8 mile wide, that is, the area of freshwater included in land area and not included in census water. This area of small water bodies is subtracted from LAND_77 to produce a better measure of land area, called simply, LAND. To correct the census water measure so that we have a measure of freshwater, we must add the SML_LAKE value to CENS_WAT, but we still need a measure of brackish waters which are included in census water, when we would then subtract from this sum.

The most expedient way to account for the inland marine water would be to locate a source with these area measurements. We contacted the National Oceanic and Atmospheric Administration and found data on acres of estuaries by state.[2] Unfortunately, the definition of estuary used to calculate these areas was not available so we could not tell if these areas corresponded with inland marine water. Also, since these estuary area measurements were reported by state, there was no way to apportion the estuary area among the counties within the state. A similar problem was encountered with saline lakes. The area of saline lakes is available by state[3], but there is no way to apportion these areas among the counties within states.

The only alternative remaining was to measure the areas of coastal embayments and salt lakes directly from maps. A complete set of U.S.

Geological Survey maps at the scale of 1:250,000 is available at the map room of the Library of Congress. The openings of every embayment, and the distance from shore to every island from Maine to Washington and around each of the Great Lakes was measured. Whenever inland marine water was encountered, the embayment was carefully traced on a light table and the tracing was coded with the state and county name and FIPS code that the embayment was in. All of the major saline lakes were also traced. The areas of the bay and salt lake tracings were measured using a planimeter.[4] The computed areas were coded for the computer so that adjustments in freshwater areas could be made to the appropriate counties. Each marine water adjustment figure was labeled with a number from 1 to 6 which identified it as being in a county that bordered the North Atlantic, South Atlantic, Gulf, Pacific, or Great Lake coasts, or a county that contained a saline lake. These location labels were used to create the three adjustment measurements needed to arrive at net freshwater. If the adjustment figures were from counties labeled 1 to 4 (the marine coasts), they were assigned to the MARINE variable for inland marine water. If they were labeled 5 for Great Lake perimeter counties, they were assigned to the variable GTLAKE for Great Lake embayments and sounds included in inland water. If they were labeled with a 6 for salt lakes, they were included In the SLTLAKE variable.

By subtracting inland saline water areas and Great Lakes embayment areas from the sum of the two original water areas. (census water plus small water bodies), we arrived at an estimate of the area of freshwater for each county in the contiguous forty-eight stated. The original water areas were WATER for large water bodies and SMLLAKE for small areas. Thus, for each county, i, the area. of freshwater was calculated by:

$$FSHWATER_i = (WATER + SMLLAKE)_i - (MARINE + GTLAKE + SLTLAKE)_i \quad i=1,...n$$

The results of these measurements and calculations are presented in table 5.D.1.

As discussed earlier, the area known as “water other than inland water” is excluded from both water and land measurements according to Census Bureau definitions, at least at the county level. Although this water may not be under the jurisdiction of particular counties, the presence of these large bodies would certainly be expected to influence the recreation participation decision of residents of countries bordering water other than inland water. In accordance with this hypothesis, we apportioned the area of these water bodies in each state to surrounding counties to create a large estuaries and bays variable, LGESBAYS. The sum of LGESBAYS and SMESBAYS provides a measure of total marine estuaries and bays, TOTESBAY. This sum does not include the Great Lakes estuaries and bays measure, GTLKESBA, or other principal saline lakes, SALTLAKE. The sum of TOTESBAY, GTLKESBA, and SALTLAKE is the total of all brackish or marine. waters. We also include a measure of all inland water, INLNDWAT, which includes freshwater and inland brackish waters, or all water (which in included in SVD as WATER) but large estuaries and bays (LGESBAYS).

Since we included large estuaries and bays in SVD, we had to also adjust total county surface area to include the surface area of LGESBAYS, so as not to overstate the fraction of a county’s total surface area covered by water. Thus we added LGESBAYS to the measure of county surface area which excludes large estuaries and bays, AREA_77, to create SURFAREA, the total county surface area. SURFAREA is the correct surface area measure to use when creating an area-per-areal measure of water. Such density measures are useful in creating a distance proxy measure, according to

Table 5.D.1
Water Area of the Contiguous United States,
by state, in Square Miles
(N = number of counties)
STATE WATER AREA FIGURES

VARIABLE	LABEL		SUM
---------- STATE=ALABAMA ----------			
FSHWATER	WATER + SMLLAK + MARIN + GTLAK + SLTLAK	67	1144.03900
WATER	CENSUS WATER GREATER THAN 40 ACRES	67	932.10753
SMLLAKE	UNIV. OF IOWA WATER LESS THAN 40 ACRES	67	241.12326
MARINE	INLAND MARINE WATER	67	29.19114
GTLAKE	INLAND GREAT LAKE WATERS	67	0.00000
SLTLAKE	SIZEABLE SALINE LAKES	67	0.00000
AREA	TOTAL SURFACE AREA	67	51307.43864
---------- STATE=ARIZONA ----------			
FSHWATER	WATER + SMLLAK + MARIN + GTLAK + SLTLAK	14	527.72915
WATER	CENSUS WATER GREATER THAN 40 ACRES	14	440.99136
SMLLAKE	UNIV. OF IOWA WATER LESS THAN 40 ACRES	14	86.93796
MARINE	INLAND MARINE WATER	14	0.00000
GTLAKE	INLAND GREAT LAKE WATERS	14	0.00000
SLTLAKE	SIZEABLE SALINE LAKES	14	0.00000
AREA	TOTAL SURFACE AREA	14	113906.44439
---------- STATE=ARKANSAS ----------			
FSHWATER	WATER + SMLLAK + MARIN + GTLAK + SLTLAK	75	1419.32300
WATER	CENSUS WATER GREATER THAN 40 ACRES	75	1074.13417
SMLLAKE	UNIV. OF IOWA WATER LESS THAN 40 ACRES	75	340.38470
MARINE	INLAND MARINE WATER	75	0.00000
GTLAKE	INLAND GREAT LAKE WATERS	75	0.00000
SLTLAKE	SIZEABLE SALINE LAKES	75	0.00000
AREA	TOTAL SURFACE AREA	75	53102.77770
---------- STATE=CALIFORNIA ----------			
FSHWATER	WATER + SMLLAK + MARIN + GTLAK + SLTLAK	58	1999.51900
WATER	CENSUS WATER GREATER THAN 40 ACRES	58	1317.74900
SMLLAKE	UNIV. OF IOWA WATER LESS THAN 40 ACRES	58	313.52470
MARINE	INLAND MARINE WATER	58	368.23502
GTLAKE	INLAND GREAT LAKE WATERS	58	0.00000
SLTLAKE	SIZEABLE SALINE LAKES	58	451.39410
AREA	TOTAL SURFACE AREA	58	158706.77104
---------- STATE=COLORADO ----------			
FSHWATER	WATER + SMLLAK + MARIN + GTLAK + SLTLAK	63	368.15100
WATER	CENSUS WATER GREATER THAN 40 ACRES	63	277.33300
SMLLAKE	UNIV. OF IOWA WATER LESS THAN 40 ACRES	63	91.11700
MARINE	INLAND MARINE WATER	63	0.00000
GTLAKE	INLAND GREAT LAKE WATERS	63	0.00000
SLTLAKE	SIZEABLE SALINE LAKES	63	0.00000

STATE WATER AREA FIGURES

VARIABLE	LABEL	N	SUM
STATE=CONNECTICUT			
SHWATER	WATER + SMLLAK + MARIN + GTLAK + SLTLAK	8	168.8775875
ATER	CENSUS WATER GREATER THAN 40 ACRES	8	144.9975075
MLLAKE	UNIV. OF IOWA WATER LESS THAN 40 ACRES	8	49.3736675
ARINE	INLAND MARINE WATER	8	25.4935895
TLAKE	INLAND GREAT LAKE WATERS	8	0.0000000
LTLAKE	SIZEABLE SALINE LAKES	8	0.0000000
REA	TOTAL SURFACE AREA	8	5006.8850125
STATE=DELAWARE			
SHWATER	WATER + SMLLAK + MARIN + GTLAK + SLTLAK	3	92.2504175
ATER	CENSUS WATER GREATER THAN 40 ACRES	3	112.1139012
MLLAKE	UNIV. OF IOWA WATER LESS THAN 40 ACRES	3	13.4244795
ARINE	INLAND MARINE WATER	3	33.2778905
TLAKE	INLAND GREAT LAKE WATERS	3	0.0000000
LTLAKE	SIZEABLE SALINE LAKES	3	0.0000000
REA	TOTAL SURFACE AREA	3	2051.4043795
STATE=FLORIDA			
SHWATER	WATER + SMLLAK + MARIN + GTLAK + SLTLAK	67	3639.4059602
ATER	CENSUS WATER GREATER THAN 40 ACRES	67	4690.0875141
MLLAKE	UNIV. OF IOWA WATER LESS THAN 40 ACRES	67	374.4500044
ARINE	INLAND MARINE WATER	67	1431.1385302
TLAKE	INLAND GREAT LAKE WATERS	67	0.0000000
LTLAKE	SIZEABLE SALINE LAKES	67	0.0000000
REA	TOTAL SURFACE AREA	67	58554.4954214
STATE=GEORGIA			
SHWATER	WATER + SMLLAK + MARIN + GTLAK + SLTLAK	159	1050.7479274
ATER	CENSUS WATER GREATER THAN 40 ACRES	159	814.2403312
MLLAKE	UNIV. OF IOWA WATER LESS THAN 40 ACRES	159	343.3975297
ARINE	INLAND MARINE WATER	159	101.3905335
TLAKE	INLAND GREAT LAKE WATERS	159	0.0000000
LTLAKE	SIZEABLE SALINE LAKES	159	0.0000000
REA	TOTAL SURFACE AREA	159	58874.7502734
STATE=IDAHO			
SHWATER	WATER + SMLLAK + MARIN + GTLAK + SLTLAK	44	1312.1434703
ATER	CENSUS WATER GREATER THAN 40 ACRES	44	1151.7099344
MLLAKE	UNIV. OF IOWA WATER LESS THAN 40 ACRES	44	160.4335359
ARINE	INLAND MARINE WATER	44	0.0000000
TLAKE	INLAND GREAT LAKE WATERS	44	0.0000000
LTLAKE	SIZEABLE SALINE LAKES	44	0.0000000
REA	TOTAL SURFACE AREA	44	83555.1623200

STATE WATER AREA FIGURES

VARIABLE	LABEL	N	SUM
STATE=ILLINOIS			
FSHWATER	WATER + SMLLAK + MARIN + GTLAK + SLTLAK	102	816.++1555c
WATER	CENSUS WATER GREATER THAN 40 ACRES	102	674.33+073
SMLLAKE	UNIV. OF IOWA WATER LESS THAN 40 ACRES	102	137.101+90c
MARINE	INLAND MARINE WATER	102	0.0000000
GTLAKE	INLAND GREAT LAKE WATERS	102	0.0000000
SLTLAKE	SIZEABLE SALINE LAKES	102	0.0000000
AREA	TOTAL SURFACE AREA	102	56394.732+575
STATE=INDIANA			
FSHWATER	WATER + SMLLAK + MARIN + GTLAK + SLTLAK	92	359.+++794+
WATER	CENSUS WATER GREATER THAN 40 ACRES	92	210.9534011
SMLLAKE	UNIV. OF IOWA WATER LESS THAN 40 ACRES	92	146.73+0753
MARINE	INLAND MARINE WATER	92	0.0000000
GTLAKE	INLAND GREAT LAKE WATERS	92	0.0000000
SLTLAKE	SIZEABLE SALINE LAKES	92	0.0000000
AREA	TOTAL SURFACE AREA	92	36252.90533++
STATE=IOWA			
FSHWATER	WATER + SMLLAK + MARIN + GTLAK + SLTLAK	99	381.1363002
WATER	CENSUS WATER GREATER THAN 40 ACRES	99	307.+17300+7
SMLLAKE	UNIV. OF IOWA WATER LESS THAN 40 ACRES	99	7..+7532+51
MARINE	INLAND MARINE WATER	99	0.0000000
GTLAKE	INLAND GREAT LAKE WATERS	99	0.0000001
SLTLAKE	SIZEABLE SALINE LAKES	99	0.0000000
AREA	TOTAL SURFACE AREA	99	56284.0063725+
STATE=KANSAS			
FSHWATER	WATER + SMLLAK + MARIN + GTLAK + SLTLAK	105	1213.++03250
WATER	CENSUS WATER GREATER THAN 40 ACRES	105	400.3027+37
SMLLAKE	UNIV. OF IOWA WATER LESS THAN 40 ACRES	105	754.3035012
MARINE	INLAND MARINE WATER	105	0.0000000
GTLAKE	INLAND GREAT LAKE WATERS	105	0.0000000
SLTLAKE	SIZEABLE SALINE LAKES	105	0.0000000
AREA	TOTAL SURFACE AREA	105	82252.+0007.
STATE=KENTUCKY			
FSHWATER	WATER + SMLLAK + MARIN + GTLAK + SLTLAK	120	890.3033753
WATER	CENSUS WATER GREATER THAN 40 ACRES	120	704.3+0773+
SMLLAKE	UNIV. OF IOWA WATER LESS THAN 40 ACRES	120	184.2503[illegible]
MARINE	INLAND MARINE WATER	120	0.0000000
GTLAKE	INLAND GREAT LAKE WATERS	120	0.0000000
SLTLAKE	SIZEABLE SALINE LAKES	120	0.0000000
AREA	TOTAL SURFACE AREA	120	40394.+521+07

STATE WATER AREA FIGURES

RIABLE	LABEL	N	SUM
STATE=LOUISIANA			
SHWATER	WATER + SMLLAK + MARIN + GTLAK + SLTLAK	64	3150.7950216
ATER	CENSUS WATER GREATER THAN 40 ACRES	64	3607.8723516
MLLAKE	UNIV. OF IOWA WATER LESS THAN 40 ACRES	64	781.2105109
ARINE	INLAND MARINE WATER	64	1238.2875405
TLAKE	INLAND GREAT LAKE WATERS	64	0.0000000
LTLAKE	SIZEABLE SALINE LAKES	64	0.0000000
REA	TOTAL SURFACE AREA	64	48521.7159109
STATE=MAINE			
SHWATER	WATER + SMLLAK + MARIN + GTLAK + SLTLAK	16	1703.8917905
ATER	CENSUS WATER GREATER THAN 40 ACRES	16	2211.3450000
MLLAKE	UNIV. OF IOWA WATER LESS THAN 40 ACRES	16	109.3417872
ARINE	INLAND MARINE WATER	16	573.9949887
TLAKE	INLAND GREAT LAKE WATERS	16	0.0000000
LTLAKE	SIZEABLE SALINE LAKES	16	0.0000000
REA	TOTAL SURFACE AREA	16	33214.2705167
STATE=MARYLAND			
SHWATER	WATER + SMLLAK + MARIN + GTLAK + SLTLAK	23	3431.5822095
ATER	CENSUS WATER GREATER THAN 40 ACRES	23	6407.0445007
MLLAKE	UNIV. OF IOWA WATER LESS THAN 40 ACRES	23	40.5136672
ARINE	INLAND MARINE WATER	23	389.8902254
TLAKE	INLAND GREAT LAKE WATERS	23	0.0000000
LTLAKE	SIZEABLE SALINE LAKES	23	0.0000000
REA	TOTAL SURFACE AREA	23	10508.5819422
STATE=MASSACHUSETTS			
SHWATER	WATER + SMLLAK + MARIN + GTLAK + SLTLAK	14	310.0610326
ATER	CENSUS WATER GREATER THAN 40 ACRES	14	370.8712259
MLLAKE	UNIV. OF IOWA WATER LESS THAN 40 ACRES	14	60.1379250
ARINE	INLAND MARINE WATER	14	120.9465232
TLAKE	INLAND GREAT LAKE WATERS	14	0.0000000
LTLAKE	SIZEABLE SALINE LAKES	14	0.0000000
REA	TOTAL SURFACE AREA	14	8256.0807969
STATE=MICHIGAN			
SHWATER	WATER + SMLLAK + MARIN + GTLAK + SLTLAK	83	1567.2354784
ATER	CENSUS WATER GREATER THAN 40 ACRES	83	1396.8207826
MLLAKE	UNIV. OF IOWA WATER LESS THAN 40 ACRES	83	218.2935403
ARINE	INLAND MARINE WATER	83	0.0000000
TLAKE	INLAND GREAT LAKE WATERS	83	47.5784497
LTLAKE	SIZEABLE SALINE LAKES	83	0.0000000
REA	TOTAL SURFACE AREA	83	58214.3237484

STATE WATER AREA FIGURES

VARIABLE	LABEL	N	SUM
STATE=MINNESOTA			
SHWATER	WATER + SMLLAK + MARIN + GTLAK + SLTLAK	87	5334.491616
WATER	CENSUS WATER GREATER THAN 40 ACRES	87	4852.522773
SMLLAKE	UNIV. OF IOWA WATER LESS THAN 40 ACRES	87	465.277373
MARINE	INLAND MARINE WATER	87	0.0000000
GTLAKE	INLAND GREAT LAKE WATERS	87	3.3053253
SLTLAKE	SIZEABLE SALINE LAKES	87	0.0000000
AREA	TOTAL SURFACE AREA	87	84056.1072125
STATE=MISSISSIPPI			
SHWATER	WATER + SMLLAK + MARIN + GTLAK + SLTLAK	82	944.3361502
WATER	CENSUS WATER GREATER THAN 40 ACRES	82	669.7406172
SMLLAKE	UNIV. OF IOWA WATER LESS THAN 40 ACRES	82	404.3279250
MARINE	INLAND MARINE WATER	82	9.7303775
GTLAKE	INLAND GREAT LAKE WATERS	82	0.0000000
SLTLAKE	SIZEABLE SALINE LAKES	82	0.0000000
AREA	TOTAL SURFACE AREA	82	47713.6633016
STATE=MISSOURI			
SHWATER	WATER + SMLLAK + MARIN + GTLAK + SLTLAK	114	1071.6039719
WATER	CENSUS WATER GREATER THAN 40 ACRES	114	736.7710859
SMLLAKE	UNIV. OF IOWA WATER LESS THAN 40 ACRES	114	333.0325859
MARINE	INLAND MARINE WATER	114	0.0000000
GTLAKE	INLAND GREAT LAKE WATERS	114	0.0000000
SLTLAKE	SIZEABLE SALINE LAKES	114	0.0000000
AREA	TOTAL SURFACE AREA	114	69604.2733234
STATE=MONTANA			
SHWATER	WATER + SMLLAK + MARIN + GTLAK + SLTLAK	56	1911.2451142
WATER	CENSUS WATER GREATER THAN 40 ACRES	56	1524.5207625
SMLLAKE	UNIV. OF IOWA WATER LESS THAN 40 ACRES	56	256.5244517
MARINE	INLAND MARINE WATER	56	0.0000000
GTLAKE	INLAND GREAT LAKE WATERS	56	0.0000000
SLTLAKE	SIZEABLE SALINE LAKES	56	0.0000000
AREA	TOTAL SURFACE AREA	56	147139.3251442
STATE=NEBRASKA			
SHWATER	WATER + SMLLAK + MARIN + GTLAK + SLTLAK	93	901.5259052
WATER	CENSUS WATER GREATER THAN 40 ACRES	93	705.2113172
SMLLAKE	UNIV. OF IOWA WATER LESS THAN 40 ACRES	93	196.3170691
MARINE	INLAND MARINE WATER	93	0.0000000
GTLAKE	INLAND GREAT LAKE WATERS	93	0.0000000
SLTLAKE	SIZEABLE SALINE LAKES	93	0.0000000
AREA	TOTAL SURFACE AREA	93	77223.9622656

STATE WATER AREA FIGURES

VARIABLE	LABEL	N	SUM
STATE=NEVADA			
SHWATER	WATER + SMLLAK + MARIN + GTLAK + SLTLAK	17	494.214729
WATER	CENSUS WATER GREATER THAN 40 ACRES	17	609.154522
SMLLAKE	UNIV. OF IOWA WATER LESS THAN 40 ACRES	17	23.060241
MARINE	INLAND MARINE WATER	17	0.000000
GTLAKE	INLAND GREAT LAKE WATERS	17	0.000000
SLTLAKE	SIZEABLE SALINE LAKES	17	238.005334
AREA	TOTAL SURFACE AREA	17	110537.575000
STATE=NEW HAMPSHIRE			
SHWATER	WATER + SMLLAK + MARIN + GTLAK + SLTLAK	10	317.+1819519
WATER	CENSUS WATER GREATER THAN 40 ACRES	10	275.47+01250
SMLLAKE	UNIV. OF IOWA WATER LESS THAN 40 ACRES	10	53.5936734+
MARINE	INLAND MARINE WATER	10	12.5494+9075
GTLAKE	INLAND GREAT LAKE WATERS	10	0.000000000
SLTLAKE	SIZEABLE SALINE LAKES	10	0.000000000
AREA	TOTAL SURFACE AREA	10	9303.797+1719
STATE=NEW JERSEY			
SHWATER	WATER + SMLLAK + MARIN + GTLAK + SLTLAK	21	198.11306+32
WATER	CENSUS WATER GREATER THAN 40 ACRES	21	320.+133+217
SMLLAKE	UNIV. OF IOWA WATER LESS THAN 40 ACRES	21	38.0134e40+
MARINE	INLAND MARINE WATER	21	158.3132+19c
GTLAKE	INLAND GREAT LAKE WATERS	21	0.000000000
SLTLAKE	SIZEABLE SALINE LAKES	21	0.000000000
AREA	TOTAL SURFACE AREA	21	7835.83++3125
STATE=NEW MEXICO			
SHWATER	WATER + SMLLAK + MARIN + GTLAK + SLTLAK	32	+70.0306321
WATER	CENSUS WATER GREATER THAN 40 ACRES	32	232.+2e+37
SMLLAKE	UNIV. OF IOWA WATER LESS THAN 40 ACRES	32	237.e0209+
MARINE	INLAND MARINE WATER	32	0.000000
GTLAKE	INLAND GREAT LAKE WATERS	32	0.000000
SLTLAKE	SIZEABLE SALINE LAKES	32	0.000000
AREA	TOTAL SURFACE AREA	32	121eee.e1.e22
STATE=NEW YORK			
SHWATER	WATER + SMLLAK + MARIN + GTLAK + SLTLAK	62	1eee.e+eee73
WATER	CENSUS WATER GREATER THAN 40 ACRES	62	1824.+++07+1
SMLLAKE	UNIV. OF IOWA WATER LESS THAN 40 ACRES	62	253.e0e+++e+
MARINE	INLAND MARINE WATER	62	344.2e0 7e39
GTLAKE	INLAND GREAT LAKE WATERS	62	6e.+935272
SLTLAKE	SIZEABLE SALINE LAKES	62	0.100.300
AREA	TOTAL SURFACE AREA	62	+9560.e5e5.ee

STATE WATER AREA FIGURES

VARIABLE	LABEL	N	SUM
STATE=NORTH CAROLINA			
SHWATER	WATER + SMLLAK + MARIN + GTLAK + SLTLAK	100	1180.1997+07
WATER	CENSUS WATER GREATER THAN 40 ACRES	100	3695.1950900
MLLAKE	UNIV. OF IOWA WATER LESS THAN 40 ACRES	100	220.2703+53
MARINE	INLAND MARINE WATER	100	2935.2000/00
GTLAKE	INLAND GREAT LAKE WATERS	100	0.0000000
SLTLAKE	SIZEABLE SALINE LAKES	100	0.0000000
AREA	TOTAL SURFACE AREA	100	52504.0297754
STATE=NORTH DAKOTA			
SHWATER	WATER + SMLLAK + MARIN + GTLAK + SLTLAK	53	1754.4447+0+
WATER	CENSUS WATER GREATER THAN 40 ACRES	53	1442.5350515
MLLAKE	UNIV. OF IOWA WATER LESS THAN 40 ACRES	53	311.9096969
MARINE	INLAND MARINE WATER	53	0.0000000
GTLAKE	INLAND GREAT LAKE WATERS	53	0.0000000
SLTLAKE	SIZEABLE SALINE LAKES	53	0.0000000
AREA	TOTAL SURFACE AREA	53	70604.9514+4+
STATE=OHIO			
SHWATER	WATER + SMLLAK + MARIN + GTLAK + SLTLAK	88	388.1944437
WATER	CENSUS WATER GREATER THAN 40 ACRES	88	271.713+705
MLLAKE	UNIV. OF IOWA WATER LESS THAN 40 ACRES	88	109.6275261
MARINE	INLAND MARINE WATER	88	- 0.0000000
GTLAKE	INLAND GREAT LAKE WATERS	88	9.1+05544
SLTLAKE	SIZEABLE SALINE LAKES	88	0.0000000
AREA	TOTAL SURFACE AREA	88	41194.1490375
STATE=OKLAHOMA			
SHWATER	WATER + SMLLAK + MARIN + GTLAK + SLTLAK	77	1719.9528703
WATER	CENSUS WATER GREATER THAN 40 ACRES	77	1293.9815203
MLLAKE	UNIV. OF IOWA WATER LESS THAN 40 ACRES	77	419.9812500
MARINE	INLAND MARINE WATER	77	0.0000000
GTLAKE	INLAND GREAT LAKE WATERS	77	0.0000000
SLTLAKE	SIZEABLE SALINE LAKES	77	0.0000000
AREA	TOTAL SURFACE AREA	77	69917.4409219
STATE=OREGON			
SHWATER	WATER + SMLLAK + MARIN + GTLAK + SLTLAK	36	1025.4342455
WATER	CENSUS WATER GREATER THAN 40 ACRES	36	940.4045625
MLLAKE	UNIV. OF IOWA WATER LESS THAN 40 ACRES	36	179.0007250
MARINE	INLAND MARINE WATER	36	51.9602150
GTLAKE	INLAND GREAT LAKE WATERS	36	0.0000000
SLTLAKE	SIZEABLE SALINE LAKES	36	47.5736+97
AREA	TOTAL SURFACE AREA	36	96979.2597+12

STATE WATER AREA FIGURES

VARIABLE	LABEL	N	SUM
STATE=PENNSYLVANIA			
SHWATER	WATER + SMLLAK + MARIN + GTLAK + SLTLAK	67	627.4460750
WATER	CENSUS WATER GREATER THAN 40 ACRES	67	418.3364391
MLLAKE	UNIV. OF IOWA WATER LESS THAN 40 ACRES	67	209.1122359
MARINE	INLAND MARINE WATER	67	0.0000000
GTLAKE	INLAND GREAT LAKE WATERS	67	0.0000000
SLTLAKE	SIZEABLE SALINE LAKES	67	0.0000000
AREA	TOTAL SURFACE AREA	67	45331.9930437
STATE=RHODE ISLAND			
SHWATER	WATER + SMLLAK + MARIN + GTLAK + SLTLAK	5	54.0264691
WATER	CENSUS WATER GREATER THAN 40 ACRES	5	104.9971125
MLLAKE	UNIV. OF IOWA WATER LESS THAN 40 ACRES	5	14.8734234
MARINE	INLAND MARINE WATER	5	124.5460577
GTLAKE	INLAND GREAT LAKE WATERS	5	0.0000000
SLTLAKE	SIZEABLE SALINE LAKES	5	0.0000000
AREA	TOTAL SURFACE AREA	5	1221.9674160
STATE=SOUTH CAROLINA			
SHWATER	WATER + SMLLAK + MARIN + GTLAK + SLTLAK	46	962.8746347
WATER	CENSUS WATER GREATER THAN 40 ACRES	46	484.3002378
MLLAKE	UNIV. OF IOWA WATER LESS THAN 40 ACRES	46	172.1246347
MARINE	INLAND MARINE WATER	46	74.8130537
GTLAKE	INLAND GREAT LAKE WATERS	46	0.0000000
SLTLAKE	SIZEABLE SALINE LAKES	46	0.0000000
AREA	TOTAL SURFACE AREA	46	3104[illegible]
STATE=SOUTH DAKOTA			
SHWATER	WATER + SMLLAK + MARIN + GTLAK + SLTLAK	67	[illegible]
WATER	CENSUS WATER GREATER THAN 40 ACRES	67	[illegible]
MLLAKE	UNIV. OF IOWA WATER LESS THAN 40 ACRES	67	[illegible]
MARINE	INLAND MARINE WATER	67	[illegible]
GTLAKE	INLAND GREAT LAKE WATERS	67	[illegible]
SLTLAKE	SIZEABLE SALINE LAKES	67	[illegible]
AREA	TOTAL SURFACE AREA	67	[illegible]
STATE=TENNESSEE			
SHWATER	WATER + SMLLAK + MARIN + GTLAK + SLTLAK	95	[illegible]
WATER	CENSUS WATER GREATER THAN 40 ACRES	95	[illegible]
MLLAKE	UNIV. OF IOWA WATER LESS THAN 40 ACRES	95	[illegible]
MARINE	INLAND MARINE WATER	95	[illegible]
GTLAKE	INLAND GREAT LAKE WATERS	95	[illegible]
SLTLAKE	SIZEABLE SALINE LAKES	95	[illegible]
AREA	TOTAL SURFACE AREA	95	[illegible]